

**IDAHO PHOTOVOLTAIC STRATEGIC PLAN  
AND  
OPERATING GUIDE**

**for the**

**IDAHO PHOTOVOLTAIC FOR UTILITIES  
STATE WORKING GROUP**

**Prepared by the  
PV Strategic Plan Sub-Committee**

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## **Preface**

The purpose of this State Photovoltaic Strategic Plan and Operating Guide is to provide background and current information on photovoltaic technology, a framework for accomplishing the mission and goals, organizational structure and ground rules in operating the Idaho PV4U State Working Group. It has been divided into two major parts, namely: Part I – Background, and Part II – Strategic Plan and Guide.

# IDAHO PHOTOVOLTAIC STRATEGIC PLAN AND OPERATING GUIDE

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# **IDAHO PHOTOVOLTAIC STRATEGIC PLAN AND OPERATING GUIDE**

## **PART I. BACKGROUND**

### **Introduction**

The development of renewable energy resources is gaining more attention from the public, energy resource planners, developers, utilities, environmental groups and others. During the 1970s, a key factor pushing the development of renewable resources was energy security. Today, while energy security is still a concern, the main focus is the environmental advantages of renewable energy resources. Recent federal legislation including the Clean Air Act Amendments of 1990 and the energy Policy Act of 1992 have mandated the use of clean fuels and encourage the utilization of renewable energy resources.

Solar energy is a source that is renewable, free and environmentally benign. The technology that utilizes solar power is fairly well developed and is divided into two general categories, solar thermal and photovoltaics (PV). Solar thermal systems convert the sun's radiation into thermal heat for buildings and process heat. In a large-scale application, steam is produced for power generation. Photovoltaic cells convert sunlight directly into electricity. This plan addresses only the application of photovoltaics.

### **Utility Photovoltaic Group**

At a December 1991 meeting in Tucson, Arizona, key leaders of the utility industry, the regulatory community, state and federal government, consumer advocates and the photovoltaic industry devised a commercialization strategy for PVs in the domestic utility sector. Their goal was to develop a sustainable market for PVs that is not susceptible to policy fluctuations, scattered technology endorsements, and premature or unrealistic expectations. Their strategy was to establish a commercialization path based on joint action and collaborative efforts by the various communities having a stake in the development of solar electricity.

The Tucson meeting generated a multi-track implementation plan which included 1) a utility-membership working group, 2) a working group addressing the analytical tools needed to remove barriers and to value the benefits and attributes of PVs, and 3) broad-based state working groups providing collaborative forums to respond to state specific circumstances.

As a result of the Tucson meeting and growing interest of utilities in PV technology, a utility group known as the Utility Photovoltaic Group (UPVG) was formed in September 1992 with the support of the American Power Association, Edison electric Institute, Electric Power Research Institute and the National Rural Electric Cooperative Association. The mission of the UPVG is to expedite and facilitate the deployment of cost-effective and emerging high value applications of photovoltaic systems for the benefit of electric utilities and their customers. As of November

1994, UPVG had 82 members from all sectors of the electric utility industry. Idaho Power Company (IPC) is the only utility in Idaho that is currently a member of UPVG.

One program being spearheaded by the UPVG is the technology Experience to Accelerate Markets in Utility Photovoltaics known as *TEAM-UP*. The six-year collaborative program aims to double the annual domestic sales of PV systems, develop a sustained market by significantly expanding utility experience with the technology and drive down costs by achieving greater economies of scale. This project is based on the premise that the real potential for driving down PV costs resides in high volume purchases.

The most significant development in the commercialization of PVs in the United States is the involvement of electric utilities in PV applications. In recent years, utilities have begun investing in PV systems for their own operation (e.g. transmission, distribution or communications), for remote electric service to their customers, grid-support applications, demand-side management, electric vehicle battery charging and other applications.

### **State Collaborative Efforts**

Photovoltaic for Utilities (PV4U) State Working Groups are also forming across the country to facilitate the implementation of PVs in the utility sector through a collaborative process. The fundamental role of the working groups is to identify regulatory, policy, and institutional barriers to PV deployment and to develop strategies to overcome those barriers.

The commercialization of energy technologies occurs at the state and local levels. Because utility activities and expenditures are regulated at the state level and local governments have jurisdiction over permitting and zoning, important issues in facilitating the adoption of photovoltaics must be addressed within state and local boundaries. The PV4U State Working Groups bring together key energy stakeholders from the electric regulatory community, the utility industry, state government, consumer advocacy and public interest organizations, and the photovoltaics industry, to participate in the collaborative process to commercialize photovoltaics at the state level.

It is essential that all stakeholders understand the standards by which photovoltaics should be judged, and develop strategies with respect to these evaluation criteria. State action starts by bringing all of the stakeholders together in non-adversarial forum that involves all parties. Access to current information is critical to learning and experience building. Enlisting all parties and decision-makers early in the process can avoid subsequent conflicts. These efforts must produce results that are replicable.

At present, 14 states have formed PV4U State Working Groups. They include Arizona, California, Colorado, Delaware, Hawaii, Idaho, Maryland, Massachusetts, New York, North Carolina, Ohio, Pennsylvania, Texas and Utah. The working groups have formed a PV4U State Working Group Alliance through which the interstate transfer of policies, programs and hardware projects can be accelerated; efforts and activities can be coordinated; information can be communicated; and market demand by each state can be aggregated.

## **Formation of the Idaho Photovoltaic for Utilities Working Group**

An initial meeting was held on March 31, 1993 in Boise to explore the idea of establishing an Idaho PV4U Working Group. The meeting, hosted by Idaho Power Company, was attended by representatives from the Idaho Public Utilities Commission, the Energy Division, Idaho Department of Commerce, Idaho Rural Development Council, consumer advocates and PV vendors. The group decided to establish an Idaho PV4U State Working Group with the possibility of merging or expanding into a regional working group in the future. Several meetings have followed to discuss various issues involving the organization, projects, etc. Other members have joined the group after the initial meeting in March 1993.

## **Cost-Effective Applications**

### **Cost-Effectiveness**

The use of photovoltaics is considered cost-effective if its installed and life cycle cost is lower than a utility's line extension, service drop, or other energy options such as using gas or diesel generators. If the benefits derived in using PVs exceed the costs, it is considered cost-effective.

The Electric Power Research Institute reported in 1992<sup>1</sup> that the average cost of single-phase line extension ranged from \$26,000 to \$28,000 per mile. Idaho Power Company's average cost of line extension is approximately \$27,000 per mile<sup>2</sup>.

The Electric Power Research Institute, Sandia National Laboratories, National Renewable energy Laboratory and others have documented various cost-effective applications of PV systems in utilities, federal and state government agencies and municipalities.

The Energy Division conducted an informal survey of electric utilities, federal and state departments in early 1994 to identify present users of PVs in Idaho. It was found that four state departments, four federal agencies and two utilities have PV installations in Idaho.

### **Utility Applications**

Over 70 electric utilities in 28 states had PV-powered systems operating in their service territories by the end of 1993. Pacific Gas and Electric, for example, had installed more than 1,100 PV systems in its own distribution systems by the end of 1992. While these applications were identified for electric utilities, they may also be cost-effective for direct users including government agencies, businesses and individuals.

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<sup>1</sup> Cost Effective Photovoltaic Applications for Utilities and their Customers, electric Power Research Institute, Palo Alto, California, 1992.

<sup>2</sup> Personal communication with John Wennstrom, Idaho Power Company, Boise, Idaho, November 15, 1994.



Nationally, several rural electric cooperatives and investor-owned utilities have initiated pilot programs or are offering PV service to their customers. Most of them offer PV for stock watering.

The Idaho Power Company is the first investor-owned utility in the country to offer a PV power option to its customers for whom it would be more costly to extend power lines. Under the three-year PV pilot tariff approved by the Idaho Public Utilities commission in September 1992, Idaho Power provides the electric service by designing, installing and maintaining the PV system. IPC owns the system, and the customer pays a flat rate of 1.6 percent per month of the net installed cost regardless of the amount of energy delivered. The tariff also requires the customer to make an initial payment of five percent of the total installed cost and sign a five-year contract for the service. Since the program was offered, four PV systems have been installed involving stock watering, remote residential lighting and domestic water pumping. IPC has recently signed a contract with the Mountain Home Air Force Base to install an 80 kW PV system to provide power to radar stations. The project is expected to be completed during the early part of 1995.

Prior to the establishment of the pilot tariff, IPC installed a 2.7 kW PV demonstration unit comprised of 12 solar panels equipped with four trackers at the Skinner Ranch in Oregon. The PV system powers a three-hp jackpump with a capacity of 21 gallons per minute at full sunshine. A propane-driven generator was also installed to provide backup to the PV systems. The system, completed in August 1991 at a cost of \$31,000, provided IPC some initial data and experience working with PV systems.

In October 1994, IPC filed a revision to the PV tariff to make it more customer-friendly. The revised PV tariff was approved by the IPUC on November 22, 1994 and was effective on December 1, 1994. The expiration of IPC's Solar Photovoltaic Tariff Pilot Program was also extended from November 15, 1995 to November 15, 1996.

K.C. Electric Association, an electric cooperative located in Hugo, Colorado, is one of the pioneers in offering a pilot service to remote stock water pumping. Although K.C. Electric has a service territory encompassing over 4,000 square miles, it has an average density of only 2.1 customers per mile of line. After a winter ice storm in March 1989 destroyed nearly 1,000 poles, K.C. Electric investigated the use of PV power for remote water pumping load as a customer service option. It has subsequently identified approximately 90 miles of distribution line, including approximately 65 well services, that could be replaced with PV power, if line is damaged and requires reconstruction in the future.

Verendrye Electric Cooperative based in Velva, North Dakota, is another utility that has an extensive experience in offering PV service for stock watering. By the end of 1993, VEC installed 26 solar pumping systems ranging from 5 to 200-foot lift. Most of the systems have two 60-watt panels as their power source.

Electric utilities that have initiated a pilot program or are presently offering PV service to their customers include Northwest Rural Public Power District, McKenzie Electric, Carbon Power and Light and others.

In Idaho, utilities that offer electric service to customers include investor-owned utilities, rural electric cooperatives and municipal electric utilities. Among these, Idaho Power Company is the only one that offers PV service to date. Clearwater Power, a rural electric cooperative in northern Idaho, uses PV in its radio transmitter but does not offer PV service. The electric utilities operating in Idaho are listed in Appendix A.

The investor-owned utilities in Idaho are regulated by the Public Utility Commission, whereas the rural electric cooperatives and municipal electric utilities are not. New programs to be implemented by RECs, such as offering PV service, are normally decided by their directors.

### **Municipal Electric Utilities**

Cost-effective applications of PV technology do not have to be remote. Some urban applications of PV can be cheaper than connecting to existing power lines due to the high cost associated with trenching roads and pavement to lay underground electric cables.

The electric utility in the city of Austin, Texas, found that it was cheaper to use stand-alone PV systems to power 15 electronic water flow meters used by the water department to study water use patterns among residential and commercial customers. The smaller flow meters use a 53-watt PV module to charge a 200-amp-hrs 6-volt battery, and the larger flow meters need four 53-watt PV modules to charge the batteries. Due to the success of the 15 stand-alone PV system installations, the city of Austin is implementing a program to identify other cost-effective applications of PV in the electric utility distribution systems.

Other cities have found cost-effective applications of PV technology including: the city of Nettleton, Colorado, for a park irrigation system; Reddington Shores, Florida, for a roadway median irrigation system; Carrollton, Texas, for school zone flashers and traffic hazard signs.

None of the 12 municipal electric utilities operating in Idaho is known to use PV in its operations. These utilities (see Appendix A) may also be targeted to use PV technologies.

### **Government Agencies**

There are other major users of PV systems that are not necessarily supplied by utilities. At present, four state departments of Idaho are using PV systems in their operations. The Idaho Department of Parks and Recreation uses PVs for fencing and buoy lighting, and wants to use PVs for lighting in a historical building being renovated as an interpretive center in eastern Idaho. The Department of Administration's Bureau of Communications uses PVs in various radio and microwave stations. The Transportation Department uses PVs in its portable traffic counters. The Idaho Department of Lands has PVs for electric fencing.

Several federal agencies in Idaho also use PVs in their operations. The U.S. Bureau of Reclamation uses PVs in its agricultural meteorological monitoring stations (AgriMet). USBR operates 53 cooperative weather stations located at various agricultural sites throughout the

Pacific Northwest Region, including Idaho. The AgriMet networks automatically collect and transmit data via satellite to a computer data base located in its regional office in Boise, Idaho.

The Soil Conservation Service uses PVs in its snow telemetry stations (SNOTEL). The stations consist of measuring devices, sensors, radio telemetry equipment and PV modules that charge the batteries. There are approximately 70 SNOTEL stations located in remote sites in Idaho.

The Bureau of Land Management installed a PV-powered pumping system for livestock in open range land in Owyhee County, Idaho, in the mid-1980s. The Boise National Forest in Idaho has 18 radio repeating stations powered by PV. Other federal agencies located outside Idaho that use PV systems include the U.S. Coast Guard, U.S. Geological Survey, and the National Park Service.

### **Commercial and Individual Applications**

While the utilities and government agencies appear to be the largest users of PVs today, the numbers of small commercial and individual users are also increasing. There is no accurate assessment of the actual number of PV systems installed in Idaho for commercial and individual users, but estimates provided by Idaho PV vendors indicate that there are probably about 250-450 installations. These are mostly PV installations in remote homes that provide power for lighting, small appliances and power tools. Most of these systems were installed by the individual users with some help from the PV vendors.

## **State Incentives**

### **Financing PV Projects**

The Energy Division of the Idaho Department of Water Resources administers a low-interest loan program to finance the development of energy conservation or energy generation projects that utilize renewable energy resources. These include solar energy, wind power, geothermal, hydropower and biomass energy resources. The program was started 1987 using oil overcharge monies returned to the state. The loans are offered at four percent interest rate and must be repaid in five years. The program provides residential loans from \$1,500 to \$10,000 and up to \$100,000 for other sectors. Specific PV projects may include water pumping for livestock, fencing, power for remote homes and other types of applications. To be eligible for financing, the PV project must be the least cost alternative and must be owned and operated by the applicant.

### **Idaho Income Tax Deduction**

Idaho has allowed an individual income tax deduction for alternative energy devices installed in a home since 1976. Qualifying devices include and system using wind, geothermal resources or solar radiation, primarily to provide heating or cooling, to produce electrical power or any combination of these. Specific solar devices may include photovoltaic systems. The entire cost (100%) of the residential PV solar system can be deducted from the taxable income up to a maximum of \$20,000. However, the deduction cannot exceed \$5,000 in any tax year. Forty

percent of the total cost to construct and install the PV system can be deducted in the year the device was put to service, and 20 percent for the next three years.

## **Barriers to PV Commercialization**

One of the major disadvantages of using a PV system is its cost compared to conventional sources of energy. While the cost of PV modules remains relatively high, the price has significantly decreased since the early 1970s. According to the United States Department of Energy<sup>3</sup> the cost of a PV module has dropped from \$500 per watt in 1972 to \$5 per watt in 1990, a 100-fold decrease in price as a result of efforts by industry and the government. USDOE expects that the price will continue to decline as the PV market grows, as manufacturing techniques improve and as module efficiencies increase. The PV world market has grown steadily from 26 megawatts in 1986 to 58 megawatts in 1993.

In addition to the price of PV modules, additional costs are added to install a complete off-the-grid PV system. Depending upon the application, an operating PV power system may include controllers, batteries, power inverters and trackers. Addition of these components to a PV system would add to the total energy cost. While the cost of energy is still high for widespread applications, PV is already cost-effective in remote and specialized uses compared to the cost of line extension or other alternatives.

UPVG<sup>4</sup> reported that the major challenge of photovoltaic commercialization is to close the “cost gap” between PV unit costs and acceptable market prices. PV costs today are very much a function of volume produced. This cost gap is an example of the classic “chicken-or-egg” dilemma: large sales volume requires lower prices, and lower prices depend on large sales.

UPVG has identified specific barriers that are preventing a broad-based utility commitment to photovoltaics. These barriers are enumerated below:

- ◆ The “cost gap” noted above;
- ◆ Need to use planning tools and data which are accepted by the utility industry to provide a full accounting of PVs benefits, thereby raising acceptable price thresholds;
- ◆ Skepticism of the broad market about PVs because they are not dispatchable and depend on an intermittent solar resource;
- ◆ Lack of information about the utility PV market, which increases the risks to suppliers and their investors who finance larger manufacturing capacity which could drive down unit costs;
- ◆ PV suppliers overlooking balance-of-system (BOS) requirements and the need for packaged systems to meet utility standards of acceptance;
- ◆ Absence of a sales, distribution, and support infrastructure that meets utility expectations traditionally based on commonly acquired electrical equipment;

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<sup>3</sup> Solar 2000, A Collaborative Strategy, U.S. Department of Energy, Office of Solar Conversion, Washington, D.C., February 1992.

<sup>4</sup> Building Technology Experience to Accelerate Markets in Utility Photovoltaics, Utility Photovoltaic Group, Washington, D. C., September 27, 1993.

- ◆ The strategic and competitive advantages renewable and non-polluting PV systems have over other technologies with similar benefits have not been quantified;
- ◆ Utilities lack the broad experience base with PVs which provides the assurance that systems meet utility standards of acceptance or offers guidance as to what applications will benefit the utility and its customers; and
- ◆ Insufficient information exists to determine the most appropriate strategies for the market acceleration of larger-scale, “high-value” applications.

The members of the Idaho PV4U were surveyed in 1993 on what they consider to be the key barriers to development and further utilization of photovoltaics. The barriers indicated are as follows:

- ◆ Cost of PV systems and the energy generated;
- ◆ Cost/benefit analysis of PV applications does not always include the true costs and benefits in comparison to conventional energy sources;
- ◆ Consumers’ lack of knowledge and/or acceptance of the application of this new and emerging technology;
- ◆ Consumers’ perception of PV systems performance and reliability;
- ◆ Availability of system components and lack of knowledge of how to put components into a system; and
- ◆ Lack of specific utility plans to incorporate PVs into new expanded uses.

## PART II. STRATEGIC PLAN AND GUIDE

### Mission and Goals

#### Mission Statement

The mission statement of the Idaho PV4U Working Group which was approved by the members during its meeting on August 12, 1993 in Boise States:

***“Promote the cost-effective utilization of PV as an energy source through a collaborative process among major stakeholders in Idaho.”***

#### Goals and Objectives

In order to provide a framework for guiding the commercialization of photovoltaic technology in Idaho and surrounding areas for various types of applications, specific goals and objectives had to be developed. The goals had to be in concert with the stated mission of the group.

In developing the goals and objectives, it is important to address the barriers to commercialization and widespread use of the PV technology. Before commercialization takes place, these barriers, both real and perceived must be overcome.

The following goals and objectives were developed based on the concerns and barriers discussed previously and the various commitments that the members agreed to in the Memorandum of Understanding, Appendix B. Idaho's goals are within the context of the national PV4U strategy to accelerate near term use of photovoltaics in the utility sector.

*Goal 1: Advance the understanding of PV technology, its benefits, and cost-effective application.*

*Objectives:*

- a. Institute or coordinate an educational program to promote PV in various sectors, including:*
  - ◆ *Members of the PV4U Working Group*
  - ◆ *Staff within the member's organization*
  - ◆ *Utilities*
  - ◆ *Interest groups*
  - ◆ *General public*
- b. Develop PV educational materials and make them available to others;*
- c. Sponsor or co-sponsor PV seminars or workshops;*
- d. Provide speakers to local civic, special interests and professional organizations to promote PV;*
- e. Prepare and distribute press releases;*
- f. Publish PV articles and case studies in member organization's newsletter and other publications; and*

*g. Present technical papers to appropriate conferences.*

*Goal 2: Facilitate the development and installation of highly educational and highly visible PV demonstration projects;*

*Objectives:*

- a. Assess interest of potential participants in installing PV demonstration projects;*
- b. Coordinate in identifying highly educational and highly visible PV demonstration projects;*
- c. Educate potential demonstration project participants on the application of PV in their own operations;*
- d. Assists in identifying funding sources and co-sponsors; and*
- e. Assist in the implementation of feasible PV projects.*

*Goal 3: Encourage and support the initiation of PV service for customers – “Electric Service Without the Wire” by electric utilities in Idaho including investor-owned utilities, rural electric cooperatives and municipal electric utilities.*

*Objectives:*

- a. Assess interest of Idaho utilities in initiating PV pilot program and other opportunities;*
- b. Coordinate and assist in educating utility managers, board members and conservation staff on the cost-effective applications of PV technologies and the value to their customers and to themselves;*
- c. Coordinate and support the development of pilot utility PV service programs;*
- d. Coordinate the establishment of a PV Support Program to provide educational, technical and programmatic support for initial PV pilot service by rural electric cooperatives, etc. (e.g. WAPA’s Circuit Rider Program); and*
- e. Coordinate and assist in the identification of funding for Pilot PV Service Programs.*

*Goal 4: Encourage and support other potential users of PV technologies, including federal agencies, state agencies, local government and other users.*

*Objectives:*

- a. Assess interest of other potential users in using PV for various types of applications;*
- b. Educate other potential users; and*
- c. Coordinate and support aggregate purchasing of PV modules.*

*Goal 5: Explore government legislation, policies, regulations, and incentives to increase the utilization of PV technology.*

### *Objectives:*

- a. Develop comments on PUC cases involving the use of PV technology;*
- b. Track proposed legislation that may affect the utilization of PV and develop comments, if appropriate; and*
- c. Encourage members to comment on proposed energy plans, utility least cost plans, and state policies to incorporate and encourage the use of PV technologies.*

The various objectives described above are basically action items that are measurable. They need to be monitored regularly to be sure that these objectives are being pursued and/or implemented. These objectives will attempt to be met through specific projects that are supported and coordinated by the Idaho PV4U Working Group and its working sub-committees.

## **Memorandum of Understanding**

The various stakeholders in Idaho have formed a coalition that could discuss the barriers associated with the widespread deployment of PV technology and implement actions to eliminate or reduce these barriers. The members have committed themselves to promote the utilization of PV in Idaho and surrounding areas through a collaborative process among the stakeholders. Their formal Memorandum of Understanding is presented in Appendix B. The MOU also outlines the general responsibilities to which members agreed to commit. Specific schedules of responsibilities of all members are presented in Appendix C.

## **Group Structure and Operating Rules**

### **Membership**

The initial meeting was attended by some key representatives of various organizations interested in the commercialization of PV technology. Invitations have been subsequently extended to other entities that may be interested. To date, the PV4U Working Group is comprised of representatives from several electric utilities, the public utility commission, the state energy office, an academic institution, the PV industries, economic development and rural development offices, consumer, environmental, and renewable energy advocates, local government, a power planning agency and other state and federal government agencies. These are the stakeholders that have an interest in using a renewable energy with minimal environmental impact and may be able to influence their constituents to increase use of photovoltaic technology for various types of applications.

The member organizations that have formally agreed to take an active part in the PV4U's activities are as follows:

Association of Idaho Cities  
Aurora Power and Design  
Bonneville Power Administration, Idaho District  
Fall River Rural electric Co-op  
Idaho Consumer Affairs



Idaho Council on Industry and the Environment  
Idaho Department of Administration, Bureau of Communications  
Idaho Department of Water Resources, Energy Division (Chair)  
Idaho Power Company (Co-chair)  
Idaho Public Utilities Commission  
Idaho Rivers United  
Idaho Rural Development Council  
Idaho State University, College of engineering  
Nez Perce Tribe  
Northwest Power Planning Council, Idaho Office  
Perry Swisher Consulting  
Solar Solutions, Inc.  
The Solutions Group  
Sunnelco, Inc.

A brief description of the member organizations is presented in Appendix C.

Each member organization designates a primary representative and may also designate up to two alternate representatives, subject to change, to represent it in the process. The present representatives are listed in Appendix C.

### **Coordinator**

The Idaho PV4U Working Group is structured with a general membership, a chairperson or coordinator and a co-coordinator. The overall function of the coordinator is to facilitate group meetings and oversee the implementation of the various objectives and action plans. The coordinator will also represent the group in the national PV4U State Working Group Alliance. The Energy Division serves as the group chair.

The co-coordinator will serve as the Group's secretary to record minutes of the meeting, if Energy Division support staff is not available. The co-coordinator will also chair one of the working sub-committees. The Idaho Power Company presently serves as the co-coordinator.

### **Working Sub-committees**

It was necessary to form several working sub-committees to help carry out the goals and objectives of the Idaho PV4U Working Group. Each sub-group is comprised of a chairperson and several members. The sub-committee chairperson provides guidance and direction to the members. He/she is responsible for the actual organization and function of the sub-committee, and reports to the PV4U Working Group on the objectives and progress of its activities. The sub-committee chairperson works closely with the PV4U coordinator.

Sub-committee work assignments are voluntary, but all parties are encouraged to participate to have an equitable distribution of work.

The current working sub-committees and their respective functions are as follows:

- a. Education/Outreach Sub-committee – Responsible for coordinating educational and training activities, preparing articles and press released, providing speakers for various organization, developing educational materials, etc.
- b. Demonstration Projects Sub-committee – Responsible for identifying, coordinating, and helping implement PV demonstration projects that are highly educational and visible.
- c. Utility Pilot Programs Sub-committee – Responsible for encouraging, supporting, coordinating and developing strategies for electric utilities to initiate PV pilot programs.
- d. User-Driven Sub-committee – Responsible for encouraging and supporting other potential users (non-utility) of PV technologies including, federal agencies, state agencies, local government and others.
- e. Policy Sub-committee – Responsible for monitoring federal, state and local legislative initiatives, policies and regulations; may develop written comments on PUC cases, energy plans and least cost plans affecting the use of PV as appropriate.

### **Ad-hoc Sub-committees**

Prior to the development of the Operating Guide, several ad-hoc sub-committees were initially established to address specific issues and projects. Most of the issues that will be discussed in the future will probably fall under the five working sub-committees of the PV4U Working Group.

The various ad-hoc committees formed are as follows:

- a. MOU Sub-committee – drafted the Memorandum of Understanding. Work has been completed.

Members: Idaho Power Co., Chair  
Idaho State University, College of Engineering  
Energy Division

- b. PV Educational Slide Project Sub-committee – presently preparing educational slide sets. This group can be made a sub-group of the Educational/Outreach Sub-committee.

Members: Aurora Power and Design, Chair  
Energy Division

- c. Demonstration Projects Sub-committee – presently developing plans and recommendations for initiating statewide PV demonstration programs.

Members: Energy Division, Chair  
Fall River Rural electric  
Aurora Power and Design  
Idaho Power Co.  
Idaho Bureau of Communications

d. Strategic Plan Sub-committee – drafted the Idaho PV Strategic Plan and Operating Guide.

Members: Energy Division, Chair  
Idaho Power Co.  
Bonneville Power Administration, Idaho District  
Idaho Public Utilities Commission  
Northwest Power Planning Council, Idaho Office

The organizational chart of the Idaho Photovoltaic Working Group is presented in Figure 1.

### **Meetings**

The Idaho PV4U Working Group will meet regularly in order to coordinate and monitor the implementation of the group's goals, objectives and action initiatives. Special meetings may be called as needed. Periodic status reports from working sub-committees and special ad-hoc committees will also be made in these meetings. These will also be an opportunity to get feedback and comments from stakeholders in the overall program progress and success in meeting the group's goals and objectives. Sharing of information and activities related to the use of PV technology is encouraged at these meetings.

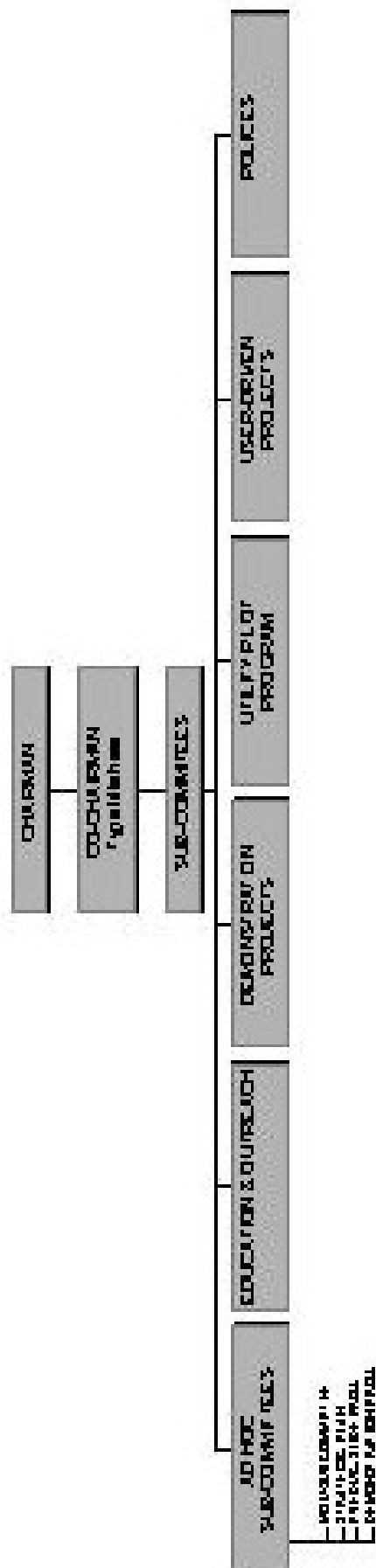
Most meetings will be scheduled in Boise and hosted by any member organization, but meetings may be held in other locations in the state. They will be scheduled when there are significant PV-related events happening, such as PV seminars or workshops, PV project tours, etc. Most of the time, they will be every three months.

Notices, meeting agendas and background materials will be prepared by the chairman and distributed to the members approximately two weeks before regularly scheduled or special meetings.

### **Group Decision Process**

The collaborative process should operate by consensus of the stakeholder working group. However, if differences arise, decisions can be made by majority vote. Each stakeholder organization is limited to one vote in decision-making matters.

# EDUCATION WORKING GROUP ORGANIZATIONAL CHART



## **Records and Reports**

Minutes of official meetings by the PV4U Group will be recorded. The Energy Division will provide a support staff, if available, to record the minutes of the meeting. If this help becomes unavailable, the co-coordinator will serve as the recorder. Draft minutes of the previous meetings will be mailed to members with the meeting notices and agendas and will be presented for approval during the following meeting.

Official communications will be sent to the designated representative and alternates including meeting notices, background information, *PV connection Newsletter*, and other relevant materials. Similar information will be mailed to other personnel deemed appropriate by the chairman.

Status of the activities by the Idaho PV4U Working Group will be reported to the PV4U SWG Alliance as requested.

The PV4U Working Group shall develop and publish an annual report for the PV4U membership. The annual report may highlight the accomplishments and activities of the Working Group from July to June of the following year. The report may also include members' experiences in the promotion, education, project planning and implementation, policy development and other PV-related activities.

A brief status report of accomplishments to date by the PV4U Working Group is presented in Appendix D.

## **Technical Resources**

The group may occasionally address PV-related issues that are technical in nature. Some members of the group, because of their more in-depth involvement with the PV technology, can act as a technical resource. It may also be necessary to invite other technical experts to talk before the group to learn more about the PV technology.

The following entities are some of the technical resources available to the Group:

- Idaho Power Company (member)
- Energy Division (member)
- Sandia National Laboratories, PV Design Center
- National Renewable Energy Laboratory
- Electric Power Research Institute

Other PV4U members representing the PV industries and consulting may be used as technical resources.

## **Timetable**

The existence of this Working Group will continue while there is a continued interest among members, and as long as there appears to be a continuing need to collaborate in the commercialization of PV technology in this state. The various working sub-committees will set up reasonable timetables to pursue specific action initiatives to achieve the objectives.

# **APPENDIX A**

## **ELECTRIC UTILITIES OPERATING IN IDAHO**

## **Electric Utilities Operating In Idaho**

### Investor-owned Utilities

Idaho Power Company  
Washington Water Power  
Utah Power and Light<sup>5</sup>  
Atlanta Power Company

### Rural Electric Cooperatives

Clearwater Power Co.  
East End Mutual Electric Co.  
Fall River Rural electric  
Idaho County Light and Power  
Kootenai Electric Co-op, Inc.  
Northern Lights, Inc.  
Raft River Electric Co-op, Inc.  
Riverside electric Company  
Rural electric Company  
Salmon River Electric Co-op  
South Side Electric Lines  
Unity Light and Power Co.

### Municipal Electric Utilities

Albion Light and Water Plant  
Bonners Ferry Light and Water  
Burley Municipal Distribution System  
Declo Municipal electric Department  
Dubois Electric System  
Heyburn Electric Dept.  
Idaho Falls Electric Light Div.  
Minidoka Electric Dept.  
Plummer Electric Dept.  
Rupert Electric Dept.  
Soda Springs Municipal Electric Light and Power Dept.  
Weiser Water & Light Dept.

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<sup>5</sup> Division of PacifiCorp.

**APPENDIX B**

**MEMORANDUM OF  
UNDERSTANDING**



## MEMORANDUM OF UNDERSTANDING

### IDAHO PHOTOVOLTAICS FOR UTILITIES (PV4U) STATE WORKING GROUP

The signatories to this to this Memorandum mutually agree that solar photovoltaic (PV) technology should be seriously considered to help meet future electric energy needs because it is a clean, renewable resource with little environmental impact and it can be produced domestically. The members believe renewable energy technologies like PV may be a preferred energy resource in the future. At present, PV is cost-effective fore many remote or specialized applications but there are barriers to widespread deployment.

The group's purpose is to promote the utilization of PV in Idaho and surrounding areas through a collaborative process among the stakeholders, which include utilities, industry, academics, consumers, environmentalists, regulators, and government. The following concepts and commitments will guide the group's activities.

- A. *Members will designate a representative to the collaborative process. Additionally, members agree to identify personnel within their organization who can attend meetings and participate in group activities or projects such as assisting in technical PV workshops or seminars sponsored by the PV4U group.*
- B. *Members agree to investigate the potential for PV applications within their organizations and to propose projects that are feasible for implementation.*
- C. *Members agree to actively promote PV demonstration or pilot projects that are either 1) cost-effective for the user when compared to available alternatives, 2) highly educational due to accessibility or high visibility, or 3) a new or different application requiring research to verify improvements.*
- D. *Members agree to examine barriers to application of PV systems and propose solutions.*
- E. *Members agree to educate personnel and/or members within their organization and the general public on PV technology and applications of PV in Idaho and surrounding areas.*
- F. *Members agree to report their experiences in the promotion, education, project planning and implementation, policy development and other related activities that may help in the widespread deployment of PV technology. Additionally, the PV4U working group shall develop and publish an annual report for the PV4U membership and other organizations as deemed appropriate by the Group.*



**APPENDIX C**

**MEMBER INFORMATION,  
REPRESENTATIVE AND  
SCHEDULE OF  
RESPONSIBILITIES**

Member Organization:

Association of Idaho Cities  
2214 Grace St.  
Boise, Idaho 83703

Designated Representative:

Elizabeth Conner, energy coordinator, (208) 344-8594 (v); (208) 344-8617 (fax)

General Information:

AIC represents 183 of Idaho's 198 cities, providing technical assistance and training to city officials as well as representing the city interests in the state legislature. Assistance is provided to cities on such topics as budgeting, planning, energy and daily city questions.

Schedule of Responsibilities in PV4U WG:

- Facilitate communication among member cities;
- Help educate AIC members on PV technology and its applications in municipal settings; and
- Participate in working group activities and sub-committees as time permits.

Member Organization:

Aurora Power and Design  
3412 N. 36<sup>th</sup>  
Boise, Idaho 83703

Designated Representative:

Dave Wilper, partner and co-owner, (208) 368-0947 (v) and (fax)

General Information:

The company designs, constructs, operates and maintains custom solar systems, PV generating plants and small hydro systems.

Schedule of Responsibilities in PV4U WG:

- Serve as appropriate on various sub-committees and sub-committees;
- Review and comment on draft reports;
- Analyze data on PV applications'
- Participate in providing technical assistance or training for those interested in PV uses; and
- Participate in various PV pilot programs, demonstration or other public education projects.

Member Organization:

Bonneville Power Administration  
1101 W. River St., Suite 250  
Boise, Idaho 83702

Designated Representative:

Felix Lopez, (208) 523-2707 (v); 208) 524-5452 (fax)  
Bonneville Power Administration  
1527 Hollipark Dr.  
Idaho Falls, Idaho 83401

General Information:

The Bonneville Power Administration (BPA), one of the U.S. Department of energy's five power marketing agencies, markets electricity from 30 federal dams and one non-federal nuclear plant in the Pacific Northwest. It sells wholesale power to public and private utilities, largest industries and either sells or exchanges power with California and Canadian utilities. It has built one of the largest most reliable transmission systems in the United States, with a service area that includes Oregon, Washington, Idaho, western Montana and small parts of Wyoming, Nevada, Utah, California and eastern Montana. It is self-funded with revenue from the sale of electric power.

As part of its mission, BPA is responsible for acquiring conservation and additional generating resources sufficient to meet the future needs of its utility customers. It has supported residential, commercial, industrial and agricultural conservation programs with utilities throughout its service territory even before the Pacific Northwest electric Power Planning and Conservation Act was passed in December 1980. The Power Act directed BPA to give priority to cost-effective conservation and renewable resources in meeting the region's needs.

Schedule of Responsibilities in PV4U WG:

- Provide support for group activities as appropriate;
- Provide technical assistance to potential PV users; and
- Review and comment on draft reports, policies, etc.

Member Organization:

Fall River Rural Electric Cooperative, Inc.  
P.O. Box 830  
Ashton, Idaho 83420-0830

Designated Representative:

Steve Knapp, administrative assistant, (208) 652-7431 (v); (208) 652-7825 (fax)

General Information:

A full requirements customer of Bonneville Power Administration, this electric utility serves about 9,000 customers in southeastern Idaho, part of Teton County, Wyoming, and part of Gallatin County, Montana.

Member Organization:

Idaho Consumer Affairs  
589 Winged Foot  
Eagle, Idaho 83616

Designated Representative:

Armand Baril, past director, (208) 939-0922

General Information:

Idaho Consumer Affairs attempts to resolve problems between Idaho consumers and businesses in a fair and unbiased manner

Schedule of Responsibilities in PV4U WG:

- Arbitrate or assist in any possible way to resolve differences between PV suppliers, designers, dealers, manufacturers, contracts, etc. and Idaho consumers.



Member Organization:

Idaho council on Industry and the Environment  
P.O. Box 255  
Boise, Idaho 83701

Designated Representative:

Ryan D. Lusher, executive director, (208) 336-8508 (v); (208) 342-8585 (fax)

General Information:

ICIE is a non-profit organization which has proven its commitment to “facilitating the use of science in shaping public policy on health and the environment.” ICIE can provide objective and timely information on resource and health issues in the state, including:

- Compilation of available data;
- Background material on resource and health issues;
- Workshop development; and
- Presentations and addresses by staff.

Schedule of Responsibilities in PV4U WG:

- Provide education and outreach activities;
- Participate in ad hoc sub-committees as member; and
- Serve as an information clearinghouse on information relating to PV developments.

Member Organization:

Idaho Department of Administration  
650 West State St.  
Boise, Idaho 83720

Designated Representative:

Jim Price, chief of the Bureau of Communications, (208) 334-3620 (v); (208) 334-5099 (fax)

General Information:

The Department of Administration is a client-oriented organization which services operational needs of state government. State agencies are provided quality, cost-effective administrative services, technical assistance, and innovative support system. The Bureau of Communications designs, installs and maintains all state radio communications systems, equipment and sites. This includes but is not limited to two-way radio, data, the state microwave network, telephone systems, and power systems.

Schedule of Responsibilities in PV4U WG:

- Participate in group activities

Member Organization:

Idaho Department of Water Resources Energy Division  
1301 North Orchard Street  
Boise, Idaho 83706

Designated Representative:

Gerry Galinato, chairman, (208) 327-7963 (v); (208) 327-7866 (fax)  
John Crockett, alternate, (208) 327-7962  
K.T. Hanna, alternate, (208) 327-7978

General Information:

The Energy Division of the Idaho Department of Water Resources is designated as the lead agency to manage and implement state energy programs that promote energy conservation through efficient energy use or utilization of renewable energy resources including:

- Information and educational assistance to energy consumers to make sound decisions on energy use;
- Programs to provide technical assistance to energy users and producers; and
- Financial assistance using available funding for conservation and renewable energy resources development.

Schedule of Responsibilities in PV4U WG:

- Provide the chairperson for the PV4U Working Group;
- Provide additional staff support for the working group activities as appropriate (e.g. writing minutes, sending meeting announcements, etc.);
- Facilitate communication among stakeholders;
- Participate in working and ad hoc sub-committees as chairperson or member;
- Participate in other solar committees organized by others (e.g. NPPC's Solar electric Generation Work Group);
- Serve as information clearinghouse on funding opportunities, PV developments, etc.;
- Provide technical assistance to potential PV users;
- Provide training on PV systems and applications (e.g. PV conferences, workshops, etc.);
- Provide low-interest loans to finance PV projects (direct PV owners and users);
- Participate in PV demonstration or pilot programs;
- Provide public education and outreach activities;
- Assist in the analysis of data on PV applications; and
- Review and comment as appropriate on draft reports, policies, IPUC cases relating to the use of PV technologies.

Member Organization:

Idaho Power Company  
P.O. Box 70  
Boise, Idaho 83707

Designated Representative:

John Wennstrom, co-chairman, (208) 388-2521 (v); (208) 383-6910 (fax)  
Jeff Brooks, alternate, (208) 388-2512

General Information:

Idaho Power is an investor-owned utility serving southern Idaho, eastern Oregon and northern Nevada. In 1993 the company began offering solar photovoltaic systems to customers under a uniform rate schedule.

Schedule of Responsibilities in pV4U WG:

- Share PV experience with the Group;
- Inform Group of future PV plans;
- Conduct research on new PV uses;
- Provide public education;
- Participate in group activities; and
- Review and comment of PV issues.

Member Organization:

Idaho Public Utilities Commission  
472 W. Washington  
P.O. Box 83720  
Boise, Idaho 83720-0074

Designated Representative:

Rick Sterling, (208) 334-0351 (v)

General Information:

The Idaho Public Utilities commission regulates all investor-owned electric, water, gas and telephone utilities in the state.

Schedule of Responsibilities in PV4U WG:

- Participate in group activities; and
- Review and comment on PV issues

Member Organization:

Idaho Rivers United  
P.O. Box 633  
Boise, Idaho 83701

Designated Representative:

Bruce Johnstone, member of the board, (208) 34307481 (v)

General Information:

An umbrella for rivers advocacy groups in the Gem State, Idaho Rivers United is a river conservation organization of more than 1,200 members. IRU's purposed are to protect, restore and enhance the state's rivers and watersheds.

Schedule of Responsibilities in PV4U WG:

- Serve as appropriate on various subcommittees, and
- Review and comment on draft reports, procedures, policies, etc.

Member Organization:

Idaho Rural Development Council  
P.O. Box 83720  
Statehouse Room 122  
Boise, Idaho 83720-3201

Designated Representative:

Richard L. Gardner, executive director, (208) 334-3131 (v)

General Information:

The Idaho Rural Development Council serves as an information clearinghouse and point of collaboration for issues of importance to rural Idaho. Its members are local, tribal, state and federal agencies, along with private and non-profit organization. The IRDC is not a service delivery organization.

Schedule of Responsibilities in PV4U WG:

- Serve as an information clearinghouse to stakeholders in rural Idaho; and
- Provide coordination between agencies of projects strategic to rural Idaho.

Member Organization:

Idaho State University  
College of Engineering  
Campus Box 8060  
Pocatello, Idaho 83209-8060

Designated Representative:

Dr. Richard M. Wabrek, P.E., (208) 236-2902 (v); (208) 326-4538 (fax)

General Information:

The Idaho State University College of Engineering offers an upper division sequence of courses in energy conversion. The topic of photovoltaics is addressed in that component.

Schedule of Responsibilities in PV4U WG:

- Participate in working and ad hoc committees as chairman or member;
- Participate in technical assistance and/or training for potential PV users;
- Participate in PV demonstration and pilot programs;
- Participate in public education and outreach activities;
- Participate in the review of draft reports and policies related to PV; and
- Assist in the analysis of data on PV applications.



Member Organization:

Nez Perce Tribe  
Department of Environmental Restoration and Waste Management  
P.O. Box 365  
Lapwai, Idaho 83540

Designated Representative:

Dr. Rico O. Cruz, (208) 843-7375 (v); (208) 843-7378 (fax)

General Information:

The Department of Environmental Restoration and Waste Management (ERWM) of the Nez Perce Tribe is mainly involved to participate and monitor the cleanup effort of the U.S. Department of Energy (DOE) at Hanford Nuclear Facility. ERWM's expertise is in environmental science/engineering, cultural affairs, program management, communications and policy analysis. The ERWM Department has six key elements in its programmatic approach with DOE and other agencies:

- Monitor, review and analyze cleanup activities at Hanford;
- Assess impacts of cleanup activities on the natural resources at Hanford;
- Develop tribal expertise on scientific and technological areas;
- Technology development;
- Provides public education and information; and
- Develop health and emergency response programs.

Schedule of Responsibilities in PV4U WG:

- Participate in PV demonstration or pilot projects;
- Participate in public education and outreach activities;
- Investigate the application of PV technology in the Reservation;
- Develop project proposals for piloting and implementation of PV technology in the Reservation;
- Coordinate PV demonstration, pilot projects and outreach activities in the Reservation;
- Participate in working or ad hoc subcommittees of the Group; and
- Assist in the analysis of data.

Member Organization:

Northwest Power Planning Council  
450 W. State St.  
P.O. Box 83720  
Boise, Idaho 83720-0062

Designated Representative:

John Barclay, power coordinator/public affairs, (208) 334-2956 (v); (208) 334-2112 (fax)

General Information:

Set up through the Northwest Power Planning and Conservation Act of 1980 (P.L. 96-501), the council is an interstate compact agency with membership from Idaho, Montana, Oregon and Washington. The council has three main charges:

- Develop a power plan to assure adequate and reliable energy;
- Develop a fish and wildlife plan to protect and rebuild populations affected by hydroelectric development; and
- Conduct an extensive public involvement program.

Schedule of Responsibilities in PV4U WG:

- Facilitate communication among stakeholders;
- Provide staff support as appropriate for working group activities;
- Participate in working sub-committees;
- Provide public education and outreach on council's solar efforts; and
- Review and comment as appropriate on draft reports, policies and regulatory activities involving PV.

Member Organization:

Perry Swisher Consulting  
8660 Oakmont Dr.  
Boise, Idaho 83704

Designated Representative:

Perry Swisher, president, (208) 376-3477 (v)

General Information:

This Boise firm offers consulting services based on years of experience on the Idaho Public Utility commission. IPUC regulates fossil and renewable energy sources.

Schedule of Responsibilities in PV4U WG:

- Review and comment on draft reports dealing with PV; and
- Serve as appropriate on various sub-committees.

Member Organization:

Solar Solutions, Inc.  
6328 Pierce Park Lane  
Boise, Idaho 83703

Designated Representative:

Russ Dane, president, (208) 85305523 (v); (208) 383-1866 (voice pager)

General Information:

A new company formed by an individual with more than 12 years experience in solar technology, Solar Solutions offers design engineering and installation of PV systems. It also provides technical assistance to both commercial and residential consumers.

Schedule of Responsibilities in PV4U WG:

- Participate in local PV demonstration projects;
- Assist in a public education and outreach process; and
- Serve as committee or sub-committee member.

Member Organization:

The Solutions Group  
206 North Fourth Avenue  
Suite 101  
Sandpoint, Idaho 83864

Designated Representative:

David Sawyer, president, (208) 265-2955 (v) and (fax)

General Information:

Solutions Group is a non-profit organization that seeks to advance sustainable development by enhancing various renewable resource technologies and uses in energy, transportation systems, new building technology and information resources. It is involved with building an electronic information system in North Idaho, which will include renewable energy materials, and in creating an electric vehicle organization.

Schedule of Responsibilities in PV4U WG:

- Participate in local PV demonstration projects; and
- Assist in public education and outreach within the northern part of the state.

Member Organization:

Sunelco  
P.O. Box 1499  
Hamilton, Montana 59840

Designated Representative:

Dan Brandborg, president; (800) 338-6844 (v); (406) 363-6046 (fax)

General Information:

Sunelco designs and sells PV systems for water pumping, remote homes, telecommunications systems, etc. Free catalog available upon request.

Schedule of Responsibilities in PV4U WG:

- Provide technical assistance; and
- Beta test new energy-efficient or PV equipment.

**APPENDIX D**

**SUMMARY OF**

**ACCOMPLISHMENTS**

## IDAHO PV4U STATE WORKING GROUP SUMMARY OF ACCOMPLISHMENTS AND ON-GOING ACTIVITIES

December, 1994

- Completed a solicitation of interest survey about forming a PV4U WG.
- Conducted a PV education/promotional survey.
- Conducted a Value Analysis Assessment Survey in response to National PV4U State Working Group Alliance.
- Coordinated with various electric utilities in Idaho, encouraging them to respond to Sandia National Laboratories' February 1994 PV Project Request for Quotations.
- Coordinated and responded to SNL RFQ solicitation, proposing three projects. No project was selected but one project is still under consideration (PV System in Mesa Falls Interpretive Center).
- Solicited interest, coordinated and responded to UPGV's TEAM-UP (Technology Experience to Accelerate Markets in Utility Photovoltaics) Early Opportunity Notice (May 1994). The WG coordinated the submission of four Idaho Projects:
  - a. Solar Summit Estates Solar Photovoltaic Residence
  - b. Grid-Connected Solar Photovoltaic Residence
  - c. Off-Grid PV Residential Service
  - d. Idaho PV Utility, State Agency Partnership (USAP) Project
- Solicited interest, coordinated and responded to NREL's STEP (Sustainable Technology Energy Partnership) program solicitation, October 1994. One PV project proposal was submitted;
  - a. Development of packaged PV systems for commercial and residential building applications. The proposed PV system could include the new solar shingle products under development.
- Formed various sub-committees to address various issues and potential PV projects/programs:
  - a. MOU sub-committee – drafted the Memorandum of Understanding. Work completed in September 1994. MOU was distributed in October 1994 for signature by member organizations.
  - b. Educational PV Slide Set Project Sub-committee – presently developing educational slide sets: (1) General, (2) Specialized stock water (utilities and others), government applications, remote homes and ranches (utilities and others).
  - c. Demonstration sub-committee – identified potential PV demonstration or pilot program that can be initiated, identified potential funding sources, and defined lead agency to pursue these projects. A sub-committee report is presently being prepared.
  - d. PV Strategic Plan Sub-committee – drafted the Idaho Photovoltaic Strategic Plan and Operating Guide. Final draft report was completed in January 1995.
- Wrote/printed articles or news releases on PV4U-related activities
  - a. "Solar Group Promotes PV Technology," *Idaho Currents*, Boise, April 1994.
  - b. "Idaho Photovoltaics Group Formed," Conservation Monitor, Portland, August 1994.



- Co-sponsored the Photovoltaic Systems Seminar, April 26-27, 1994, Pocatello.
- Participated in PV Technical Committees:
  - a. Northwest Power Planning Council's Solar Electric Generation Work Group, Portland. (IPC and IDWR)
- Made Technical PV Presentations:
  - a. John Wennstrom, Idaho
    - SOLTECH Conference, Ponte Vedra, Florida, March 1-3, 1994
    - UPVG's 1994 Annual Meeting, Phoenix, Arizona, March 24-31, 1994.
  - b. Gerry Galinato, IDWR Energy Division IDWR's 1994 Annual Technical Conference; Boise, Idaho, April 14, 1994.